

CLAIMS

5 1. A method of branding a gemstone diamond comprising:
directing a focused ion beam at the gemstone diamond to be
branded and

10 manipulating the beam such that the beam impacts the surface
of the gemstone diamond at a number of specified locations for a
specified amount of time at each location to graphitize a portion
of the gemstone diamond in the shape of a desired design.

15 2. The method of claim 1 wherein the focused ion beam is
manipulated by a computer.

20 3. The method of claim 1 wherein the design is not visible
to the naked human eye.

25 4. The method of claim 3 wherein the design is less than
250 micrometers wide at its widest point.

30 5. The method of claim 3 wherein the design is between
about 7 nanometers and 250 micrometers wide at its widest point.

35 6. The method of claim 1 wherein the focused ion beam is
composed of Gallium
ions.

7. The method of claim 1 further comprising removing the
graphitized portions of the gemstone diamond so that the design
5 is carved into the surface of the gemstone diamond.

8. The method of claim 1 wherein the gemstone diamond is
10 coated with a conductive layer.

9. The method of claim 8 wherein the conductive layer is
carbon.

15 10. The method of claim 1 wherein the gemstone diamond is
exposed to a charge neutralizer.

20 11. A method of branding a gemstone diamond comprising the
steps of:

securing the gemstone diamond onto a holder capable of being
used in a coordinate transfer system;

25 using the coordinate transfer system to create mapping data
which represents the distances between the location on the
gemstone diamond which will be branded and certain set reference
points on the holder;

30 using the mapping data to manipulate a focused ion beam
machine such that it produces a focused ion beam which impacts the
gemstone diamond at a desired location for a desired length of
35 time to brand to design onto the gemstone diamond.

12. The method of claim 11 further comprising generating
design data which represents the design to be branded onto the
5 gemstone diamond; and using the design data in conjunction with
the mapping data to manipulate the focused ion beam.

10 13. The method of claim 11 further comprising the step of
coating the gemstone diamond with a layer of conductive coating.

14. The method of claim 13 wherein the charged particles are
15 carbon.

15. The method of claim 11 wherein the holder is conductive.

20 16. The method of claim 15 wherein the holder is aluminum.

17. The method of claim 15 wherein the holder is copper.

25 18. The method of claim 11 wherein the holder is capable of
holding more than one gemstone diamond at a time.

30 19. The method of claim 11 wherein the holder is portable.

20. The method of claim 10 wherein the holder includes at
least three reference
35 points.

21. The method of claim 11 wherein the coordinate transfer
system identifies at least three reference points on the holder
5 and determines the mapping data which comprises at least a
horizontal offset, a vertical offset, and a rotational offset.

10 22. The method of claim 21 wherein the mapping data is
determined for more than one gemstone diamond.

23. The method of claim 12 wherein the design data is
15 converted into stream files
which comprise data representing the design in the form of pixels
and offsets from a local coordinate system.

20 24. The method of claim 23 wherein the ion beam is
manipulated to impact the gemstone diamond such that the gemstone
diamond is branded wherein each impacted area corresponds to one
pixel of the design.

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25. The method of claim 12 further comprises the step of
relating a local coordinate system associated with the design to
be branded on the gemstone diamond to a global coordinate system
30 associated with the mapping data.

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26. The method of claim 11 wherein the focused ion beam
brands the gemstone diamond by converting a portion of the
5 gemstone diamond into graphite.

27. The method of 26 further comprising the step of removing
10 the graphite.

28. The method of claim 27 wherein the graphite is removed
by exposing the branded gemstone diamond to potassium nitrate.
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29. The method of claim 27 wherein the graphite is removed
by exposing the branded gemstone diamond to plasma.

20 30. The method of claim 11 wherein a voltage applied to
produce the ion beam is manipulated such that the computer is able
to vary how far the ion beam penetrates the surface of the
gemstone diamond and how deeply the gemstone diamond is branded.
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31. An apparatus for branding a gemstone diamond comprising:
a coordinate transfer system controlled by a computer;
30 a focused ion beam machine manipulated by the computer;
one or more computer programs, performed by the computer
attached to the coordinate transfer system, for generating mapping
data which represent the distances between the location on the
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gemstone diamond which will be branded and certain set reference points on the holder;

5 one or more computer programs, performed by the computer for using the mapping data to manipulate the focused ion beam machine such that it produces a focused ion beam which impacts a surface of the gemstone diamond at one or more desired locations for a
10 predetermined length of time to brand the design onto the gemstone diamond.

15 32. The apparatus of claim 31 further comprising one or more computer programs, performed by the computer, for generating design data which represent the design to be branded onto the gemstone diamond and using the design data in conjunction with the
20 mapping data to manipulate the focused ion beam machine.

25 33. The apparatus of claim 31 further comprising a second computer connected to the first computer wherein the first computer performs one or more computer programs for creating mapping data which represent the distances between the location on the gemstone diamond which will be branded and certain set
30 reference points on the holder; and the second computer performs one or more computer programs for using the mapping data to manipulate the focused ion beam machine, such that it produces a focused ion beam which impacts the gemstone diamond at a desired

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location for a desired length of time to brand the design onto the
gemstone diamond.

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34. The apparatus of claim 33 further comprising a third
computer connected to the first computer, wherein the third
computer performs one or more computer programs for generating
design data which represents the design to be branded onto the
10 gemstone diamond.

35. The apparatus of claim 34 wherein the design is
15 converted into stream files which comprise data representing the
design in the form of pixels and offsets from a local coordinate
system.

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36. The apparatus of claim 35 wherein the design is a bar-
code.

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